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EXERCISES.

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PROVE that in an ellipse the area of the triangle formed by the tangents at the points whose eccentric angles are α, β, γ, respectively, is

$$A = ab \tan \tfrac{1}{2} (\alpha - \beta) \tan \tfrac{1}{2} (\beta - \gamma) \tan \tfrac{1}{2} (\gamma - \alpha) .$$

[*F. P. Matz.*]

374

SHOW without resorting to the Differential Calculus that the two parabolas whose equations are $y^2 = ax$ and $x^2 = by$ intersect at an angle

$$\theta = \tan^{-1} [3a^{\frac{1}{3}}b^{\frac{1}{3}}/2(a^{\frac{2}{3}} + b^{\frac{2}{3}})] .$$

[*F. P. Matz.*]

375

IF the hodograph of a curve described under constant acceleration be a parabola in which the radius-vectors are drawn from the focus, the intrinsic equation of the curve described is

$$s = c \int \sec^5 \tfrac{1}{2}\varphi \, d\varphi .$$

[*F. P. Matz.*]

376

AT each end of a horizontal base-line $2a$ the angle of elevation of a monument is θ, and at the middle point of this base-line the angle of elevation is φ. Prove that the height of the monument is

$$H = \frac{a \sin \varphi \sin \theta}{\sqrt{[\sin (\varphi + \theta) \sin (\varphi - \theta)]}} .$$

[*F. P. Matz.*]

377

PROVE that the rectangle under the focal distances of the origin in the conic represented by the equation $ax^2 + 2hxy + by^2 = 2y$, is $R = 1/(ab - h^2)$.

[*F. P. Matz.*]

378

A SPHERICAL shrapnel-shell moving at a height $h = 100$ feet above the earth and with a velocity $V = 1700$ feet per second, explodes scattering equably with a velocity $v = 1600$ feet per second its contents and fragments. Draw a curve bounding that part of the earth's surface on which the contents and fragments of the exploded shell have fallen. [*F. P. Matz.*]